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Revision of the genus *Hemicycla* Swainson, 1840 (Mollusca, Helicidae) from Tenerife : *Adiverticula* n. subgen. and description of three new taxa [1]

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Résumé. — Révision des espèces du genre *Hemicycla* Swainson, 1840 (Mollusca, Helicidae) de Ténérife : description d'*Adiverticula* n. subgen. et de trois nouveaux taxons du groupe-espèce. Le nouveau sous-genre *Hemicycla (Adiverticula)* est caractérisé par l'absence de diverticule au conduit de la spermathèque. *Hemicycla (Adiverticula) mascaensis* n. sp., *H. (H.) bidentalis inaccessibilis* n. ssp. et *H. (H.) glyceia silensis* n. ssp., originaires de Ténérife (Canaries), sont décrits sur la base de leur anatomie génitale, de la radula et de la coquille. La distribution fossile et moderne de ces taxons est illustrée. Des lectotypes d'*Helix hedeia, Helix thoryna* et *Helix evergasta* Mabille, 1882, sont désignés et figurés.

Abstract. — A new subgenus of *Hemicycla* : *Adiverticula* n. subgen., characterized by the absence of the diverticulum in the pedunculus of the spermatheca is described as well as a new species and two new subspecies : *Hemicycla (Adiverticula) mascaensis* n. sp., *Hemicycla (Hemicycla) bidentalis inaccessibilis* n. ssp. and *Hemicycla (Hemicycla) glyceia silensis* n. ssp., all from the island of Tenerife (Canary Islands). Details of the anatomy of genitalia, radula, shell as well as recent and fossil distribution are presented. Lectotypes of *Helix hedeia, Helix thoryna* and *Helix evergasta* Mabille, 1882, are designated and figured.

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INTRODUCTION

In a previous article (IBÁÑEZ & cols., 1987), we commenced a revision of the genus *Hemicycla*, endemic to the Canarian archipelago. Notwithstanding the large number of malacologists that worked on the fauna of the island, like LAMARCK (1816-1822), FÉRUSSAC (1821), WEBB & BERTHELOT (1833), ORBIGNY (1839), L. PFEIFFER (1848), SHUTTLEWORTH (1852*a, b*), GRASSET (1856), LOWE (1861), MORELET (1864), MOUSSON (1872), WOLLASTON (1878), MABILLE (1882-1885), GUDE (1896) and O. BOETTGER (1908), the actual malacological fauna of Tenerife is imperfectly known, and three taxa passed unnoticed which we describe in this work : two of them (*mascaensis* n. sp. and *bidentalis inaccessibilis* n. ssp.) were previously not recognized because of the inaccessibility of their habitat and the other (*glyceia silensis* n. ssp.), because of its apparent conchological resemblance to a common species, *bidentalis*

1. Notes on the Malacofauna of the Canary Islands, Nr. 9. Nr. 8 : Revision of the genus *Hemicycla* Swainson, 1840 on Tenerife. I. The group of *Hemicycla plicaria* (Lamarck, 1816) (Mollusca, Helicidae). *Arch. Moll.*, **118** (1/3) : 77-103.

(Lamarck, 1822) [syn. = *malleata* Férussac, 1822] from which it is clearly differentiated by its genital system.

On the other hand, the absence of diverticulum in the pedunculus of the spermatheca has allowed us to establish a new subgenus, *Adiverticula*, which includes in Tenerife the species *adansoni* (WEBB & BERTHELOT, 1833) and *mascaensis* n. sp.

Genus **HEMICYCLA** Swainson, 1840

TYPE-SPECIES : *Helix plicaria* Lamarck, 1816, by original designation (SWAINSON, 1840 : 164).

Adiverticula Alonso & Ibáñez, n. subgen.

DIAGNOSIS : Genital system : the pedunculus of the spermatheca is lacking the diverticulum.

TYPE SPECIES : *Hemicycla (Adiverticula) adansoni* (Webb & Berthelot, 1833).

In relation to the diagnosis it is necessary to mention that HESSE (1912) described and figured the genital system of this species together with the one of *pouchet* (FÉRUSSAC, 1821) [sub nomine *plicaria*], pointing out the absence of a diverticulum. Nineteen years later, the same author (HESSE, 1931) described the genital system of *pouchet* [sub nomine *plicaria*] indicating the possibility that there might have been an error in the identification of the material studied by him in 1912 (of which he no longer had the shells), and that the authentic "*plicaria*" [= *pouchet*] does in fact possess a diverticulum in its genital system ; in this paper he also pointed out the possible importance of this anatomical characteristic for the establishment of subgenera within the genus *Hemicycla*.

With respect to the shell, there is a common characteristic of the two species of this subgenus which clearly differentiates them from other species of Tenerife, namely the strong granulation of the shell. However, it cannot be considered as a characteristic to be included in the diagnosis of *Adiverticula* because in other islands of the Canarian archipelago there are species with both a granulated shell and with a diverticulum in the genital system.

Hemicycla (Adiverticula) adansoni (Webb & Berthelot, 1833)

(Pl. I, 1 ; pl. II, 5 ; pl. III, 7-10 ; pl. IV, 11-13)

SYNONYMIE

v* 1833 — *Helix adansoni* Webb & Berthelot, *Annls Sci. nat.*, **28** : 313 [loc. typ. : " Gran Canaria " ; hic. restr. : Northeastern part of Tenerife].
1850 — *Helix pouchet* ; DESHAYES in FÉRUSSAC & DESHAYES, Hist. nat., (7) : 115.
? 1852 — *Helix adansoni* ; REEVE, Conch. Icon., **7** : pl. 134 fig. 829.
1878 — *Helix (Hemicycla) pouchet* ; WOLLASTON, Test. atl. : 344.
v* 1882 — *Helix evergasta* Mabille, *Bull. Soc. philomath. Paris*, (7), **6** : 133 [loc. typ. : Teneriffe ; hic. restr. : southern slopes of Anaga mountains ; n. syn. ; plate 4 fig. 11, lectotype, MNHN].

v* 1882 — *Helix hedeia* Mabille, *Bull. Soc. philomath. Paris*, (7), **6** : 134 [loc. typ. : Teneriffe ; hic. restr. : southern slopes of Anaga mountains ; n. syn. ; plate 4 fig. 12, lectotype, MNHN].
v* 1882 — *Helix thoryna* Mabille, *Bull. Soc. philomath. Paris*, (7), **6** : 135 [loc. typ. : Teneriffe ; hic. restr. : southern slopes of Anaga mountains ; n. syn. ; plate 4 fig. 13, lectotype, MNHN].
1884 — *Helix hedeia* ; Mabille, *Nouv. Archs Mus. Hist. nat., Paris*, (2), **7** : 270, pl. 16 fig. 2.
1884 — *Helix thoryna* ; Mabille, *Nouv. Archs Mus. Hist. nat., Paris*, (2), **7** : 272, pl. 17 fig. 15.
1884 — *Helix evergasta* ; Mabille, *Nouv. Archs Mus. Hist. nat., Paris*, (2), **7** : 278, pl. 17 fig. 1.
1895 — *Helix pouchet* ; Krause, *Nachr-Bl. dt. malakozool. Ges.*, **27** : 24, pl. 1 fig. 4 [genitalia].
?* 1896 — *Hemicycla pouchet* var. *geminata* Gude, *Proc. malacol. Soc.*, **2** (1) : 16, fig. II [loc. typ. : Santa Cruz de Tenerife].
1912 — *Hemicycla adansoni* ; Hesse, *Abh. senckenb. naturforsch. Ges.*, **31** : 77, pl. 3 fig. 9-13 [jaw, radula, genitalia, dart].
1912 — *Hemicycla plicaria* ; Hesse, *Abh. senckenb. naturforsch. Ges.*, **31** : 79, pl. 3 fig. 14-17 [jaw, genitalia].
1931 — *Hemicycla pouchet* ; Hesse, *Zoologica*, **31** : 97, pl. 12 fig. 104 a, b [genitalia].
1975 — *Helix adansoni* ; Shuttleworth *in* Backhuys, Tab. inedit., pl. 5 fig. 6.

v = vidi, original material examined ; * = reference of nomenclatoric importance ; ? = doubtful, but probably referable to the taxon.

Nomenclatural notes : the problem of the name *Helix pouchet* Férussac

The pre-linnean name " Le Pouchet ", introduced by Adanson (1757), was validated in the combination *Helix pouchet* by Férussac (1821) who referred to Adanson's figure and to material in his own collection, which he figured one year later (Férussac, 1822). Since these references are not accompanied by a description, the name is valid from 1821 by reference to Adanson's figure.

A nomenclatural problem arises from the fact that the specimen figured by Férussac (1822 : pl. 42 fig. 3) belongs to a different species, for which later the name *Helix adansoni* Webb & Berthelot was introduced. These author's considered that the specimens figured by Adanson (= *pouchet* Férussac, 1821) and those figured by Férussac (1822) (undescribed until 1833) belonged to the same species, indicating : " Obs. — Nomen latinum annuente ipso cl. de Feruss. mutavimus ". This was in fact wrong.

Thatfore we do not accept *adansoni* Webb & Berthelot, 1833, as an objective synonym of *pouchet* Férussac, 1821, but as a valid introduced name for the var. a *major* Férussac, 1821 [nomen nudum], the only taxon figured by Férussac (1822).

This confusion can be traced in the papers of many authors, who more or less randomly used the names *pouchet* and *adansoni* for the species here designated as *Hemicycla adansoni*.

The specimen of *adansoni* figured by Férussac (1822) was erroneously designated as lectotype of *Helix poucheti* (unjustified emendation for *pouchet*) by Groh (1985 : 414, pl. 1 fig. 1 a-c). This shell has no status as type material. Two shells of " Le Pouchet " in the Adanson collection are two syntypes of *Helix pouchet* Férussac, 1821 (Fischer-Piette, 1942).

Material examined

Type material : 3 probable syntypes of *adansoni* (BMNH 1854.9.28.11), marked with the number 42 in the list of Gray (1854) ; leg. Webb & Berthelot. Lectotype and 2 paralectotypes of *hedeia* as well as of *evergasta*, lectotype of *thoryna*, " lectotype " and 3 " paralectotypes " of *pouchet* var. a *major* (coll. Férussac, MNHN).

Further material : 2 ex., environs of Valle Seco (SMF 33576) ; 1 (of 5) ex., Bco. Bufadero (SMF 212652) ; 1 ex., Santa Cruz de Tenerife (SMF 75637) ; 47 ex., environs of Bco. Tahodio ; 37 ex., environs of Bco. Bufadero ; 40 ex., environs of Bajamar ; 11 ex., environs of San Andrés ; 29 ex., subfossil, environs of San Andrés ; 4 ex., fossil, near the road to San Andrés (all in MCNT).

Collected by us : 410 shells and 3 living specimens ; additionally 106 subfossils from San Andrés ; it is localized (pl. II, 5) in the northeastern part of the island, occuring in the ravines between Santa Cruz and Igueste de San Andrés. The vegetation of this zone is dominated by the teasel and the tabaiba (*Euphorbia canariensts* and *E. obtusifolia regis-jubae*, respectively) which are part of the vegetation of lower plains.

Predominantly *adansoni* occurs under rocks and in the bottom of the ravines.

Description

The shell is imperforate, solid, of a globose shape and slightly conical, with 4 1/2 whorls with a deep and rather pronounced suture except in the first whorl, where the suture is lineal (pl. III, 7). The coloration is a uniform brown, although in some specimens four darker very diffused bands are insinuated. Surface matt.

The most outstanding characteristic of the shell is that its totally granulated. This granulation is thickened (pl. III, 9) and is arranged on weakly pronounced oblique striae which do not reach to form costulae and tend to disappear near the base. On the body whorl, apart from the growth lines, a weak spiral striation appears. Under high magnification it can be seen that all the spaces between striae and granules exhibit the same sculpture as the protoconch (pl. III, 8), consting of a very thin and tenuous granulation. The protoconch is of the same colour as the rest of the shell and, besides the granulation, has a small striation in the proximity of the suture lines.

The body whorl possesses a keel that disappears towards the end of the same, where it becomes more globose ; just before its inclination towards the aperture it undergoes a reduction in width ; in the descending zone towards the aperture it again widened, and just before the peristome a further narrowing occurs, which gives it a very distinct appearance, and the gibbosity (that also exists in other species) becomes very evident.

The aperture is oblique, slightly angulated and rounded. The peristome is white, thickened and upwardly recurved, with a laminated rim. The margins barely converge in the insertion and are united by a white lip that is very apparent in older individuals. The superior margin is angulary arched, the most external margin has a dentiform callus that is small and scarcely pronounced, the columellary margin is straightened, with an elongated callus within which forms an angle in the union with the external margin.

The width varies from 19.6 to 26 mm (average : 22.43 mm) and height from 12 to 16.75 mm (average : 14.2 mm) (measurements obtained from 176 specimens).

The radular morphology corresponds to that described for the genus (Ibáñez & cols., 1987). It consists of 142 rows of teeth ; formula : C + 12L + 27M (pl. III, 10).

The genital system (pl. I, 1) is characterized by the lack of a diverticulum on the pedunculus of the spermatheca ; this pedunculus, the penis and the flagellum are long while the epiphallus is short. The mucous glands each have 3-4 digitations.

DISCUSSION

Externally the species resembles some ecological forms of *bidentalis*, it being on occasions extremely difficult , if not impossible, to determine whether a particular shell belongs to one or the other species, since we have studied shells with similar shape and ornamentation type intermediate between the two. It is quite possible that the extraordinary resemblance which is occasionally present is due to an adaptation to the same biotope. In this case specimens can only be correctly identified by the presence or absence of the diverticulum in the genital system.

Hemicycla (Adiverticula) mascaensis Alonso & Ibáñez, n. sp.
(pl. I, 2 ; pl. II, 5 ; pl. IV, 14-17)

During an excursion carried out in November 1983 to Masca (pl. II, 5) 35 shells and 13 living specimens of *Hemicycla* were collected which proved to belong to a new species of this genus. In view of this, subsequent field trips were carried out to the same site to collect more material, resulting in a total of 169 shells, 55 of which were collected alive.

HOLOTYPE : Collected by J. A. DIAZ, M. IBÁÑEZ and P. MORALES the 14 November 1983, in Masca (UTM : 28RCS1931), at an altitude of 500 m. Deposited in the collection ALONSO-IBÁÑEZ (DZUL).

PARATYPES : Collected by M. IBÁÑEZ and collaborators between 14th November 1983 and 12th March 1985, in Masca. Deposited in ANSP (n. 361421), BMNH (n. 1988044), FMNH (n. 205914/3), MNHN, SMF (n. 307.335), RNHL (n. 55867), NMW (n. 1988.086), MCNT and collections ALONSO-IBÁÑEZ (DZUL), GROH and RIPKEN.

DERIVATIO NOMINIS : The specific name is derived from the name of the type locality, Masca, where the species was collected.

BIOTOPE : The habitat is typically lowland with some endemics of the genera *Euphorbia (E. bourgaeana)* and *Aeonium (A. sedifolium, A. buchardii)*. In this biotope, *mascaensis* appears preferably under rocks, or is found buried beside the large " pitas ", aloe (*Agave americana*).

DESCRIPTION

The shell is solid, globose-depressed, with four whorls, with a linear suture (pl. IV, 14). In the majority of specimens the umbilicus appears covered by an expansion of the peristome, but in some cases it is not totally covered.

The coloration of the dorsal surface is dark or reddish, due to the presence of four dark bands that encircle each whorl, which lie over a brownish or yellowish background. The dorsal surface has little gloss, while the ventral one has more shine and is paler, and in some specimens is of a greyish colour ; on this surface a fifth band is included, which appears very dispersed.

The apex is of a uniform brownish colour and exhibits a very thin granulation (pl. IV, 16). The rest of the shell exhibits striae of folds and a strong granulation that is very pronounced in the last whorl (pl. IV, 15). The granules appear preferentially on top of the folds but are also

present in the spaces which separate them. On the basal surface the granulation is very light and tends to disappear towards the umbilical region.

The body whorl is slightly flattened and lacks the keel. The peristome is white and slightly outwardly expanded ; it presents two very slight thickenings which make the shape of the aperture appear not perfectly oval but slightly angulated. One of the thickenings appears in the superior margin, in front of the umbilicus, and the other in the columellar margin, in the proximities of its insertion ; the two margins tend to converge in their insertion.

The width varies from 14 to 16.8 mm (average : 15.38 mm) and the height from 7 to 9 mm (average : 8.11 mm) (measurements obtained from 81 specimens).

The radula (pl. IV, 17) consists of 138 teeth rows with the following formula : C + 10L + 25M.

The most outstanding characteristic of the genital system (pl. I, 2) is that it lacks a diverticulum ; the flagellum is long, somewhat more than the pedunculus of the spermatheca. The mucous glands each have only 1 digitation.

Discussion

Because of its conchological characteristics, this species is closely related to *paivana* (Morelet, 1864) and *quadricincta* (Morelet, 1864) of La Gomera, and to *saponacea* (Lowe, 1861) of Gran Canaria. It is separated from the first by its coloration and by its dimensions since *paivana* is larger than *mascaensis*, although both share their sculpture, the depressed form, and the partially uncovered umbilicus of some specimens. Whereas *saponacea* and *mascaensis* share the same dimensions and the depressed form *saponacea* always presents the umbilicus totally covered and its granulation is much more evident with larger granules. Furthermore, we had the opportunity to study the anatomy of these two species which was unknown up to now. We have been able to observe that apart from a similar flagellum length they exhibit no other common anatomical characteristics, since *saponacea* as well as *paivana* possess a diverticulum in the genital system.

Finally, *mascaensis* clearly differs from *quadricincta*, of which the genital system anatomy is not known, by the ornamentation of the shell which in this species does not exhibit the strong and prominent granulation of *mascaensis*, but rather a minute microscopical granulation between the radial costulations.

With respect to the genital system *mascaensis* can only be related to *adansoni*, since both share a characteristic that differentiates them from the rest of the species of *Hemicycla* (with a known genital system anatomy), namely the absence of a diverticulum. Furthermore, both possess a granular sculpture on the shell although they are clearly distinct species on the basis of the other conchological criteria (general shape, dimensions, coloration, etc.).

Hemicycla (Hemicycla) glyceia silensis Cavero, n. ssp.

(Pl. I, 3 ; pl. II, 6 ; pl. V, 18-21)

We collected members of a subfossil population (pl. V, 22) which correspond to *Hemicycla glyceia* (Mabille, 1882) (we have compared our material with the MNHN type material ; design. of lectotypus : Groh, 1985, pl. 1 fig. 11 a-c), from a xeric zone of Teno

(pl. II, 6). In the Monte del Agua we have collected specimens of a second taxon that we believe represents a new subspecies of *glyceia : glyceia silensis* n. ssp. (pl. V, 18).

HOLOTYPE : Collected by M. IBÁÑEZ and E. CAVERO the 9.05.1984 in the Picon (Monte del Agua) at an altitude of 880 m (UTM : 28RCS2134). It is deposited in the collection ALONSO-IBÁÑEZ (DZUL).

PARATYPES : Collected by M. IBÁÑEZ and collaborators between May of 1983 and June of 1985 ; also, the examined material of SMF and MCNT. They are deposited in the collections ALONSO-IBÁÑEZ (DZUL), GROH and RIPKEN and in the museums BMNH (n. 1988045), SMF (n. 307.334), MNHN, RNHL (n. 55866) and MCNT.

DERIVATIO NOMINIS : The subspecific name derives from Los Silos which is the municipality to which the Monte del Agua belongs and the locality where the specimens of this subspecies were collected.

BIOTOPE : As we previously indicated, we have only found this subspecies in the Monte del Agua (pl. II, 6). The vegetation found near this site is a typical laurisilva, and is very humid during almost the whole year.

MATERIAL EXAMINED

2 shells (SMF 212645, leg. Español, ex. Jaeckel) of Los Silos.

Collected by us : 45 shells and 38 living specimens ; also we examined some specimens from the malacological collections of the Museum of Natural Sciences from Tenerife, which were erroneously identified as *bidentalis*.

This new subspecies was first collected in May of 1982 in the Picon (Monte del Agua) and subsequently we have only found it in the laurisilva (laurel forest) zone of the Monte del Agua.

DESCRIPTION

The shell is high, imperforated, large, very strong, shiny and has a globose-conical shape (pl. V, 18). It has five whorls, with a suture that is scarcely pronounced in the early whorls but quite prominant on the body whorl. Its colour is dark brown, caused by the presence of four bands which are distributed in the following way : the lower one is on the base, the upper one under the suture and the other two are very wide and coalesce on the body whorl. The colour is yellowish-brown on the sutures and on the base.

The most outstanding feature of the sculpture is that the whole shell bears uniformly shallow malleation which stands out on the body whorl, while on the remaining whorls a weak oblique or radial striation predominates. Also, the whole shell shows a very clear spiral striation that appears both on the rim of the malleation and in the interstice, giving it a striated appearance which can only be seen with a stereomicroscope (pl. V, 19). The protoconch is reddish, it is minutely granulated and is striated in the suture zone (pl. V, 20).

The body whorl is angular at its origin without forming a keel, becoming rounded and quite gibbose due to the presence of a narrowing just before of the peristome.

The aperture is oval and slightly bilobate, with a small tooth on the external margin, and a marked callosity at the insertion of the superior margin. The peristome is circular, white, greaty thickened and upwardly recurved. The columellar margin is thickened within, the upper and columellar margins tend to converge in their insertion points, generally being united by a white lip. The shell dimensions are shown in table I.

TABLE I. — Dimensions (in mm) of the shells of *glyceia glyceia* and *glyceia silensis* n. ssp. (n : number of measured specimens.)

	WIDTH			HEIGTH			n
	min	max	average	min	max	average	
glyceia glyceia	25.5	28	26.65	17.3	20	18.65	14
glyceia silensis	20.35	24.6	22.45	13.2	17.8	15.68	35

The radula (pl. V, 21) consists of 140 teeth rŏws with the following radular formula : C + 14L + 28M.

The genital system (pl. I, 3) is characterized by being the largest of all the taxa described in this study. The most outstanding feature is the enormous length of the flagellum which appears totally convoluted within the animal. The mucous glands are also very long, with 2-4 digitations to each. The penis is long and the epiphallus is of medium length. The common duct to the spermatheca and diverticulum also have large dimensions which aproximately correspond to half of the length of the flagellum. The spermatheca and the diverticulum have similar dimensions although the latter is usually somewhat longer. These two ducts are shorter than the common duct to both.

DISCUSSION

MABILLE (1882) found the extinct species *glyceia* in the Anaga beacon ; we found another subfossil population of *glyceia* in Teno and compared the type material and the Teno population with *glyceia silensis* n. ssp. ; *glyceia silensis* n. ssp. is differentiated from *glyceia glyceia* by the considerably smaller shell dimensions (table I).

Both subspecies are related to *bidentalis*, sharing with it the general appearance, the sculpture, and the type of habitat (laurisilva). On account of this we suspect that they were previously frequently mistaken for the latter species. There are for example specimens of *glyceia silensis* n. ssp. identified as *bidentalis* in the collections of terrestrial molluscs of the MONT and the SMF.

TABLE II. — Averages (in mm) of the lengths from the ducts which comprise the principal differences between the genital systems of *bidentalis, glyceia silensis* n. ssp. and *glasiana*. (F : flagellum ; CC : common duct ; CE : duct of the spermatheca ; D : diverticulum ; n : number of measured specimens.)

	bidentalis (Palo Blanco)	*glyceia silensis*	*glasiana*
F	19.94	41.11	53
CC	13	21.87	17
CE	11.42	13.58	11.5
D	13.39	15.36	8
n	48	14	2

Within the variation range of *bidentalis*, the form most closely related to *glyceia silensis* is the one of Palo Blanco. However, there are a number of very clear differences between the two :

the shell is more globose and larger than that of *bidentalis*, but the principal differences are found in the morphology of the genital system (table II) since *glyceia silensis* not only exhibits the largest genital dimensions of all the species in this study, but also has both, a flagellum and a common duct, of enormous length (more than twice the size of *bidentalis*). Because of these characteristics it can be compared with *glasiana* (Shuttleworth, 1852) of Gran Canaria, the reproductive system of which bears a certain resemblance in having a very long flagellum and which was also confused with *bidentalis* for some time. Nevertheless, it is well separated from the latter by having larger dimensions, a narrower aperture, less prominent teeth and by having a granular sculpture lacking malleations. Following examination of a specimen of *glasiana*, we realized that the flagellum of this species is even longer than in *glyceia silensis* n. ssp. and measures more than three-times the length of the common duct. In addition the common duct of *glasiana* is shorter than the one of *glyceia silensis*. Another differential characteristic which we observed is that in *glasiana* the diverticulum is very short and shorter than the pedunculus of the spermatheca, while in *glyceia silensis* generally the diverticulum is larger than this duct.

Prior to the Holocene *bidentalis* and *glyceia* apparently occured sympatrically in the Anaga mountains, hence, their speciation took part before the Quaternary when *glyceia* obviously had a wider distribution on the island and whilst the populations in the Anaga became extinct, a relict population persisted in Teno. Apparently the Teno had no real *bidentalis*-populations.

Hemicycla (Hemicycla) bidentalis inaccessibilis Groh, n. ssp.
(pl. I, 4 ; pl. II, 6 ; pl. VI, 23-26)

This new subspecies was collected for the first time on 10th April 1982 in the Roque de Fuera de Anaga during an excursion conducted by A. Martín, E. Hernández and J. L. Rodríguez. On this occasion 17 shells were collected. Subsequently more material was found in the same islet on different dates, totalling 48 shells and one living specimen which was collected by J. L. Rodríguez.

Holotype : Collected by A. Martín and J. L. Rodríguez on the 17.02.1985 in the Roque de Fuera (UTM : 28RCS8764), at an aproximated altitude of 50 m. It is found deposited in the collection Alonso-Ibáñez (DZUL).

Paratypes : Collected by E. Hernández, A. Martín and J. L. Rodríguez between 10.04.1982 and 17.02.1985. They are found in the collections Alonso-Ibáñez (DZUL), Groh, and in the museums ANSP (n. 361422), FMNH (n. 205913/2), MNHN, SMF (n. 307.333), BMNH (n. 1986131) and MCNT.

Derivatio nominis : The subspecific name was derived from the difficulty in obtaining this taxon since the Roque de Fuera de Anaga can only be accessed with a small boat and only on days with a calm sea.

Biotope : The Roque de Fuera is a scarped islet, situated at 1 450 m from the coast of the Anaga mountains, with a surface of 0.06 square kilometers and a maximum altitude of 66 m (pl. II, 6). Logically, the influence of the breeze and the marine spume is very high hence the temperatures are mild and the salinity is elevated. The vegetation is composed of halophilous communities of the lower plains principally of *Mesembrianthemum cristallynum*, and abounding with the species of the Chenopodiaceae, as *Beta* cf. *procumbens*.

DESCRIPTION

The shell is imperforate, of a globose-conical shape, with 4 1/2 whorls, of a solid consistency (pl. VI, 23), not glossy ; it is of a clear uniform brown colour with four very tenuous darker bands.

Its most outstanding characteristic is the weak radial costulation, interrupted by a spiral striation which in some zones, especially in the first and second whorl, gives rise to more or less thickened granules (pl. VI, 24). The basal surface of the shell is more shiny because the ribs are very weak and present no granules but merely a spiral striation. On this part the ribs converge towards the columellar zone.

The protoconch is more reddish and smoother although it has a weak striation and granulation (pl. VI, 25). The body whorl has a keel which extends only over the first half, before it becomes globose with a small gibbosity.

The aperture is oval, a bit angular, with the columellary margin internally thickened. The peristome is white and slightly outwardly expanded. The margins tend to converge at the insertion.

The width varies from 17.8 to 20.2 mm (average : 19.09 mm) and the height from 11.3 to 12.5 mm (average : 11.81 mm) (measurements obtained from 11 specimens).

The radula (pl. VI, 26) consists of 139 rows of teeth, with the following formula : C + 14L + 27M.

The genital system (pl. I, 4) exhibits a long flagellum. The penis and the common duct to the diverticulum and to the spermatheca are also long. The pedunculus of the spermatheca is larger than the diverticulum which is quite short. The mucous glands each have 2-3 digitations.

DISCUSSION

Hemicycla bidentalis shows a large population variability and some ecotypes and subspecies can be discriminated.

The Benijo population of *bidentalis* exhibits the highest degree of similarity with *bidentalis inaccessibilis* n. ssp. on conchological criteria. In fact, the ornamentation of the shell is very similar in both populations with the exception of the malleation which is weak in the Benijo population, but completely absent in the new subspecies. Secondly, the latter totally lacks teeth in the aperture whilst in the population of Benijo the typical teeth of *bidentalis* are present, although very reduced. The principal differences between both populations reside in their dimensions. Thus, the dimensions of the population of Benijo exceeds the population of Roque de Fuera by 3.4 mm with respect to the width and by 3 mm in respect to the height.

With regard to the genital system, the dimensions of the only specimen studied are within the extreme values known for *bidentalis*, differing fundamentally from the population of Benijo in that the common duct is larger than the one of the spermatheca and the diverticulum, which is the opposite case in the population of Benijo.

We have assigned a subspecific taxonomic category to this population because of the period of time that the Roque de Fuera has remained isolated from the coast of Anaga (nearly 10 000 years), a span of time generally considered insufficient for the completion of a speciation process.

The subspecies also bears resemblance to the species of the *plicaria* group in its ornamentation, although it is clearly differentiated from them because of its larger number of radial costulations. On the other hand, the spaces between the costulations also possess spiral striae while in the species close to *plicaria* they do no exist. Finally, the costulations of the *bidentalis inaccessibilis* n. ssp. are more irregular than the costulations of these species.

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Abbreviations of scientific institutions

ANSP : Academy of Natural Sciences, Philadelphia.
BMNH : British Museum (Natural History), London.
DZUL : Departamento de Zoologia de la Universidad de La Laguna (Tenerife).
FMNH : Field Museum of Natural History, Chicago.
MCNT : Museo de Ciencias Naturales de Tenerife.
MCHN : Museum Cantonale d'Histoire Naturelle, Genève.
MNHN : Museum National d'Histoire Naturelle, Paris.
MNZ : Museum für Naturkunde, Zürich.
NMB : Naturhistorisches Museum, Basel.
NMW : National Museum of Wales, Cardiff.
SMF : Naturmuseum Senckenberg, Frankfurt/Main.
RNHL : Rijksmuseum van Natuurlijke Historie, Leiden.

LITERATURE CITED

ADANSON, 1757. — Histoire naturelle du Sénégal. Coquillages. Paris, 190 + XCVI + 275 p., 19 pls.

BOETTGER, O., 1908. — Liste der Mollusken aus einem Sande im Barranco von Tegina auf Tenerife (Canaren). *Z. dt. geol. Ges., Monatsber.*, **60** (8/10) : 246-249.

FÉRUSSAC, J. B. DE, 1821. — Tableaux systématiques des animaux mollusques, classés en familles naturelles, dans lesquels on a établi la concordance de tous les systèmes ; suivis d'un Prodrome général pour tous les mollusques terrestres ou fluviatiles, vivants ou fossiles. Paris, 110 p.

FÉRUSSAC, J. B. DE, & G. P. DESHAYES, 1819-1851. — Histoire naturelle générale et particulière des mollusques terrestres et fluviatiles tant des espèces que l'on trouve aujourd'hui vivantes, que des dépouilles fossiles de celles qui n'existent plus ; classés d'après les caractères essentiels que présentent ces animaux et leurs coquilles. Vol. I : 402 p. [1839-1851 : DESHAYES] and atlas, 161 pls. Paris (J. B. Baillière) [Livr. 1-28 (FÉRUSSAC) : 1819-1832 ; livr. 29-34 (DESHAYES) : 1839-1841 ; livr. 35 (DESHAYES) : 1850 ; cfr. KENNARD, 1942].

FISCHER-PIETTE, E., 1942. — Les Mollusques d'ADANSON. *J. Conch., Paris*, **85** (2) : 103-366, pl. 1-16.

GRASSET, A., 1856. — Description de coquilles nouvelles provenant des Iles Canaries. *J. Conch., Paris*, **6** : 345-348.

GRAY, J. E., 1854. — List of the shells of the Canaries in the collection of the British Museum, collected by MM. Webb and Berthelot. Described and figured by Prof. Alcide d'Orbigny in the " Histoire naturelle des Iles Canaries ". London, 32 p.

GROH, K., 1985. — Landschnecken aus quartären Wirbeltierfundstellen der Kanarischen Inseln (Gastropoda). *Bonn. zool. Beitr.*, **36** (3/4) : 395-415.

GUDE, G. K., 1896. — Description of a new species of *Vitrina* and new forms of Helicidae, with a list of the helicoid shells hitherto found in the Canary Islands. *Proc. malac. Soc. Lond.*, **2** : 15-22.

HESSE, P., 1912. — Die Anatomie einiger Arten des Genus *Hemicycla* Swainson. *Abh. senckenb. naturforsch. Ges.*, **31** : 76-82, pl. 3.

— 1931. — Zur Anatomie und Systematik palaearktischer Stylommatophoren. *Zoologica*, **31** : 1-118, pls. 1-17.

IBÁÑEZ, M., K. GROH, E. CAVERO & M. R. ALONSO, 1987. — Revision of the genus *Hemicycla* Swainson 1840 on Tenerife. I. The group of *Hemicycla plicaria* (Lamarck, 1816) (Mollusca, Helicidae). *Arch. Moll.*, **118** (1/3) : 77-103.

KENNARD, A. C. S., 1942. — The Histoire and Prodrome of Férussac. *Proc. malac. Soc. Lond.*, **25**. I : 12-17 ; II : 105-110 ; III : 111-118.

LAMARCK, J. B. DE, 1816. — Encyclopédie Méthodique, Tableaux. Paris, (84), pls. 391-488.

— 1822. — Histoire Naturelle des Animaux sans Vertèbres. Paris, **6** (2) : 252 p.

LOWE, R. T., 1861. — Diagnosis of new Canarian Land-Mollusca. *Ann. Mag. nat. Hist.*, **3** (7) : 104-112.

MABILLE, J., 1882. — Molluscronm [*sic*] novorum diagnoses succinctae. *Bull. Soc. philomath. Paris*, (7), **6** : 132-147.

— 1883*a*. — Sur quelques espèces de mollusques terrestres. *Bull. Soc. philomath. Paris*, (7), **7** : 39-53.

— 1883*b*. — Diagnoses testarum novarum. *Bull. Soc. philomath. Paris*, (7), **7** : 115-132.

— 1884. — Matériaux pour une faune malacologique des Iles Canaries. I. *Nouv. Archs Mus. Hist. nat., Paris*, (2), **7** : 201-284, pls. 15-18.

— 1885. — Matériaux pour une faune malacologique des Iles Canaries. II. *Nouv. Archs Mus. Hist. nat., Paris*, (2), **8** : 17-182.

MORELET, A., 1864. — Descriptions de coquilles inédites. *J. Conch., Paris*, **12** : 155-156.

MOUSSON, A., 1872. — Révision de la faune malacologique des Canaries. *Neue Denkschr. allg. schweiz. Ges. ges. Naturw.*, **25** : 1-176, 6 pls.

ORBIGNY, A. D'., 1839. — Mollusques, Echinodermes, Foraminifères et Polypiers recueillis aux Iles Canaries par MM. Webb et Berthelot. *In* : P. B. WEBB & S. BERTHELOT, Histoire Naturelle des Iles Canaries. Paris, **2** (2) : 152 p., 14 pls.

PFEIFFER, L., 1848. — Monographia Heliceorum viventium. Leipzig, **1** : 594 p.

SHUTTLEWORTH, R. J., 1852*a*. — Diagnosen einiger neuen Mollusken aus den Canarischen Inseln. *Mitt. naturf. Ges. Bern*, **241/242** : 137-146.

— 1852*b*. — Diagnosen neuer Mollusken. *Mitt. naturf. Ges. Bern*, **260/261** : 289-304.

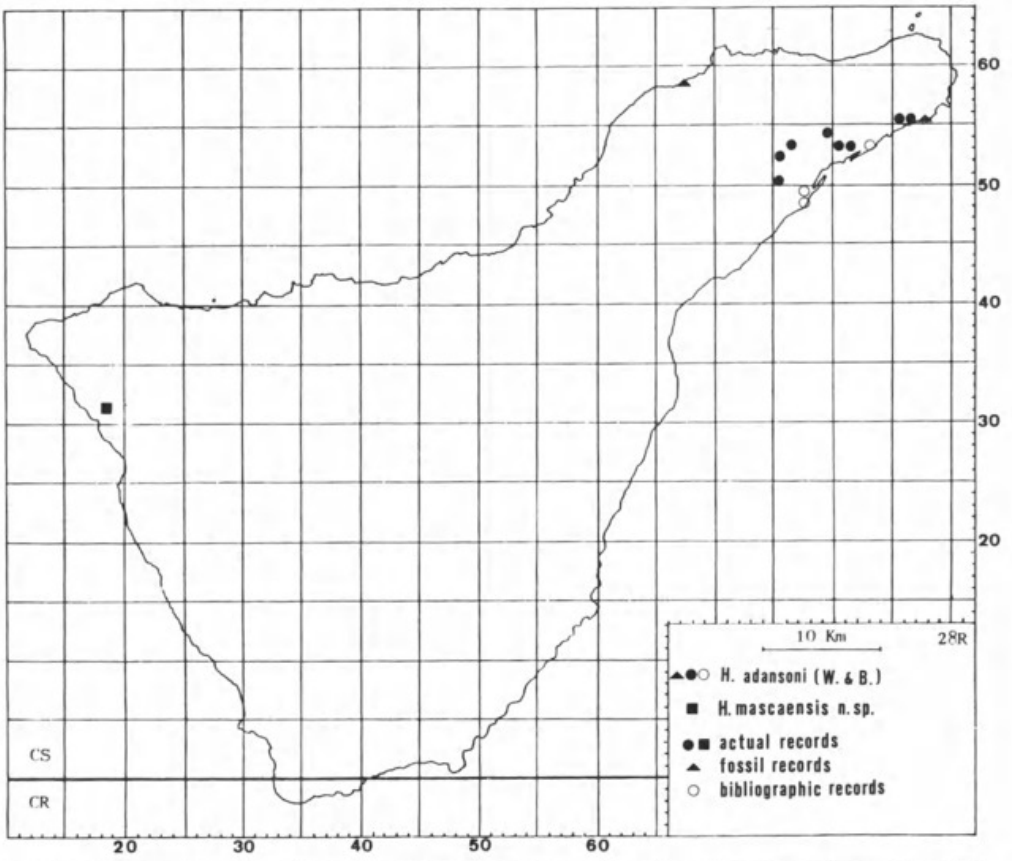
— 1975. — *In* : W. BACKHUYS [edit.], Tabulae ineditae Molluscorum Insularum Canariensium. Goecke & Evers, Krefeld, 43 p., 8 pls.

SWAINSON, W., 1840. — A treatise on malacology : or the natural classification of shells and shell-fish. London, 419 p.

WEBB, P. B., & T. S. BERTHELOT, 1833. — Synopsis Molluscorum terrestrium et fluviatilium quas in itineribus per insulas Canarias, observarunt. *Annls Sci. nat.*, **28** : 307-326.

WOLLASTON, T. V., 1878. — Testacea atlantica or the land and freshwater shells of the Azores, Madeiras, Salvages, Canaries, Cape Verdes and Saint Helena. London, 588 p.

PLATE I.— Genital system (scale : 4 mm) : 1, *Hemicycla adansoni* (Webb & Berthelot, 1833) ; 2, *Hemicycla mascaensis* n. sp. (paratype) ; 3, *Hemicycla glyceia silensis* n. ssp. (paratype) ; 4, *Hemicycla bidentalis inaccessibilis* n. ssp. (holotype).



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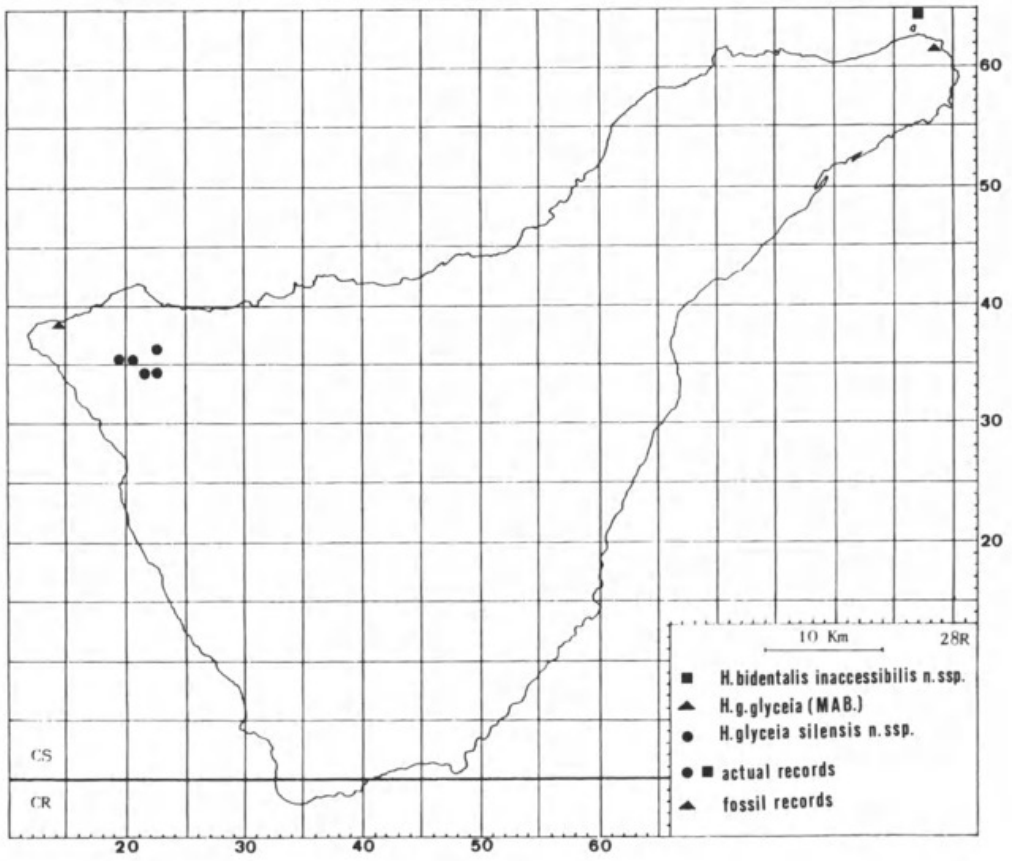

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PLATE II. — Geographical distribution in Tenerife : 5, *Hemicycla adansoni* (Webb & Berthelot, 1833) ; and *Hemicycla mascaensis* n. sp. ; 6, *Hemicycla bidentalis inaccessibilis* n. ssp., *Hemicycla glyceia glyceia* (Mabille, 1882) and *Hemicycla glyceia silensis* n. ssp.

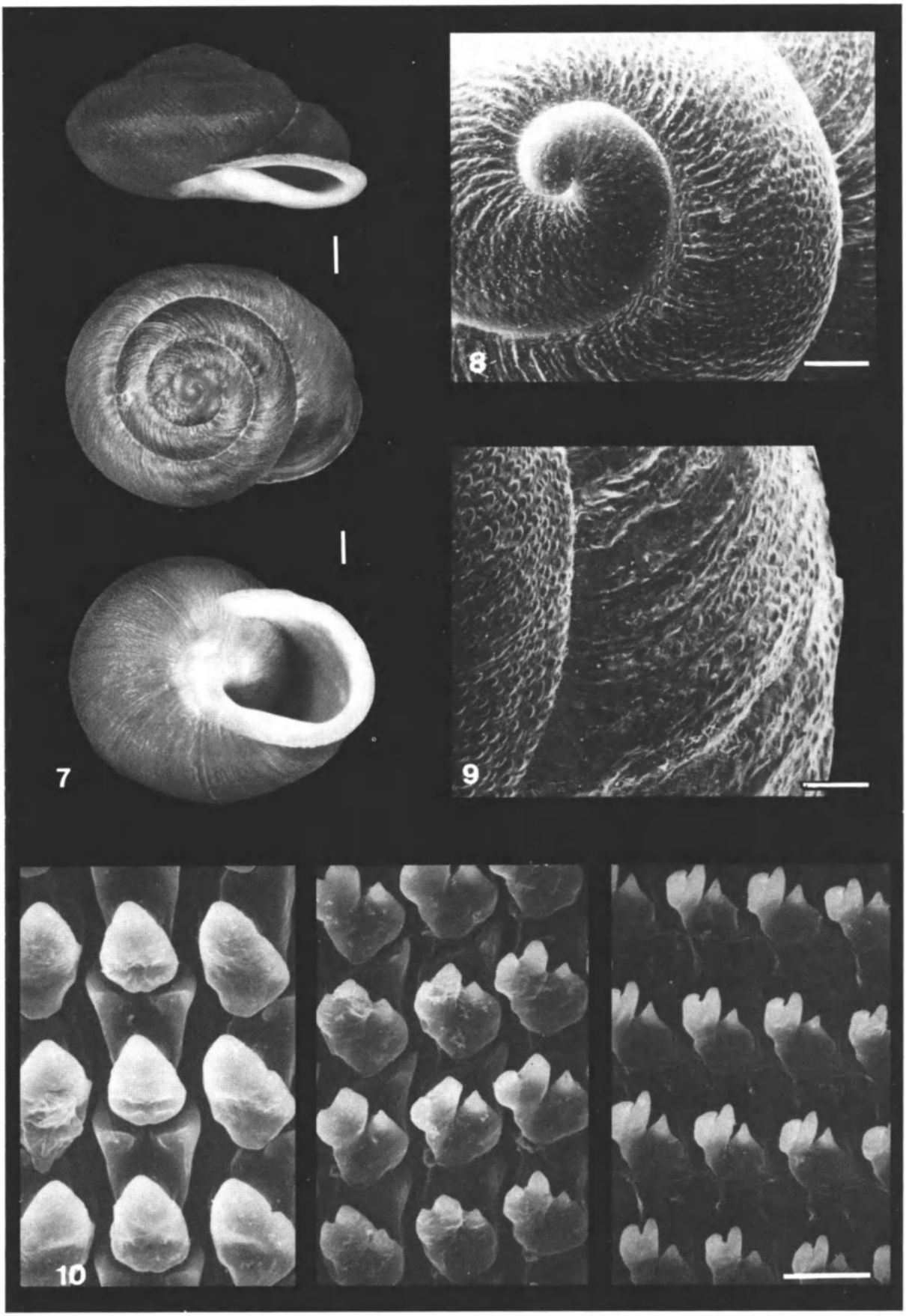

PLATE III. — *Hemicycla adansoni* (Webb & Berthelot, 1833) : 7, shell (× 2) (Bco. de Jagua, 100 m) ; 8, protoconch (scale : 600 μm) ; 9, detail of the body whorl (scale : 600 μm) ; 10, radula (scale : 25 μm).

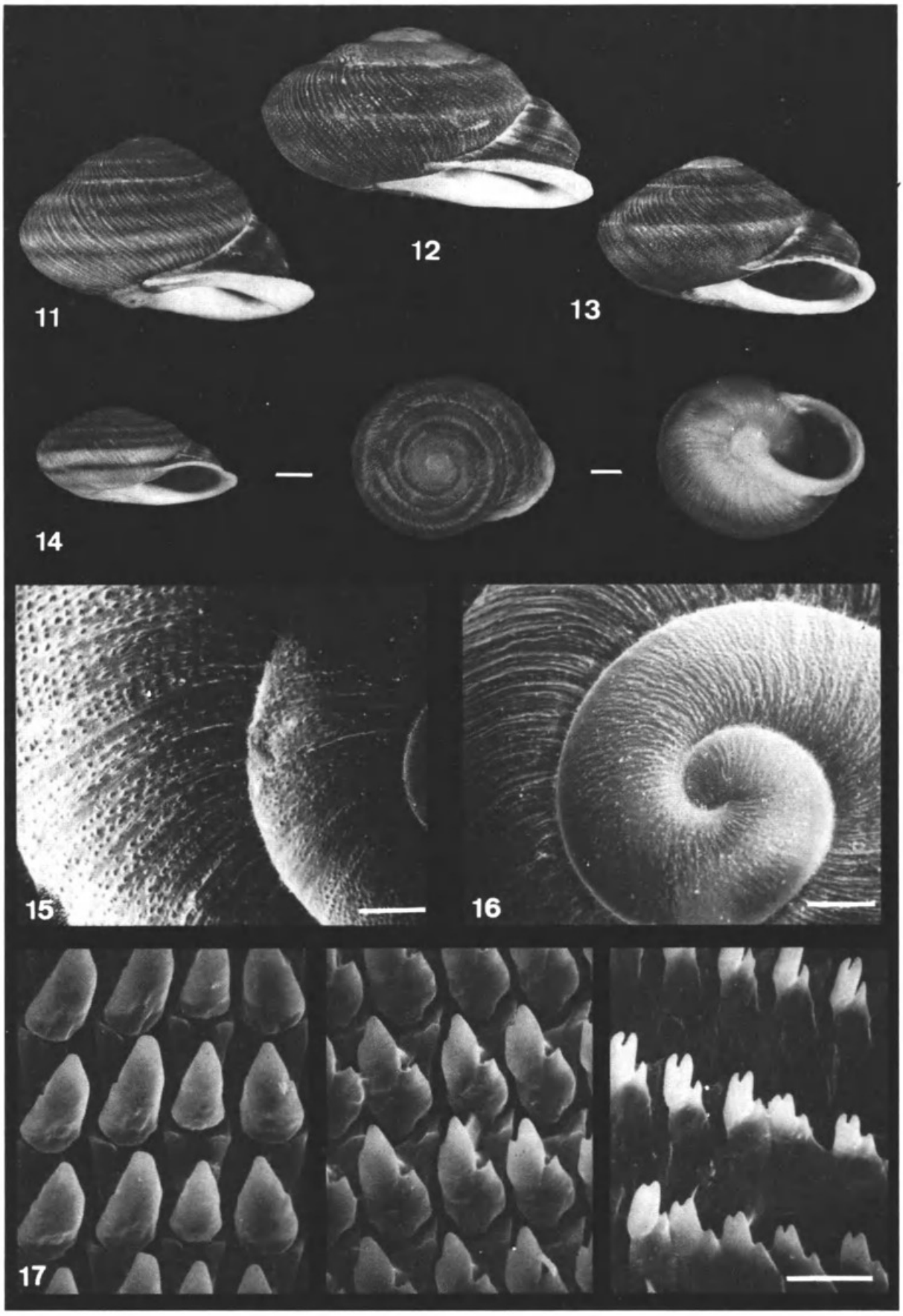

PLATE IV. — 11-13, shells (× 2) of the lectotypes, MNHN : 11, *Helix evergasta* Mabille, 1882 ; 12, *Helix hedeia* Mabille, 1882 ; 13, *Helix thoryna* Mabille, 1882. — 14-17, *Hemicycla mascaensis* n. sp. : 14, shell (× 2) of the holotype (Masca, 500 m) ; 15, detail of the last two whorls of the shell of a paratype (scale : 600 μm) ; 16, protoconch of a paratype (scale : 600 μm) ; 17, radula of a paratype (scale : 25 μm).

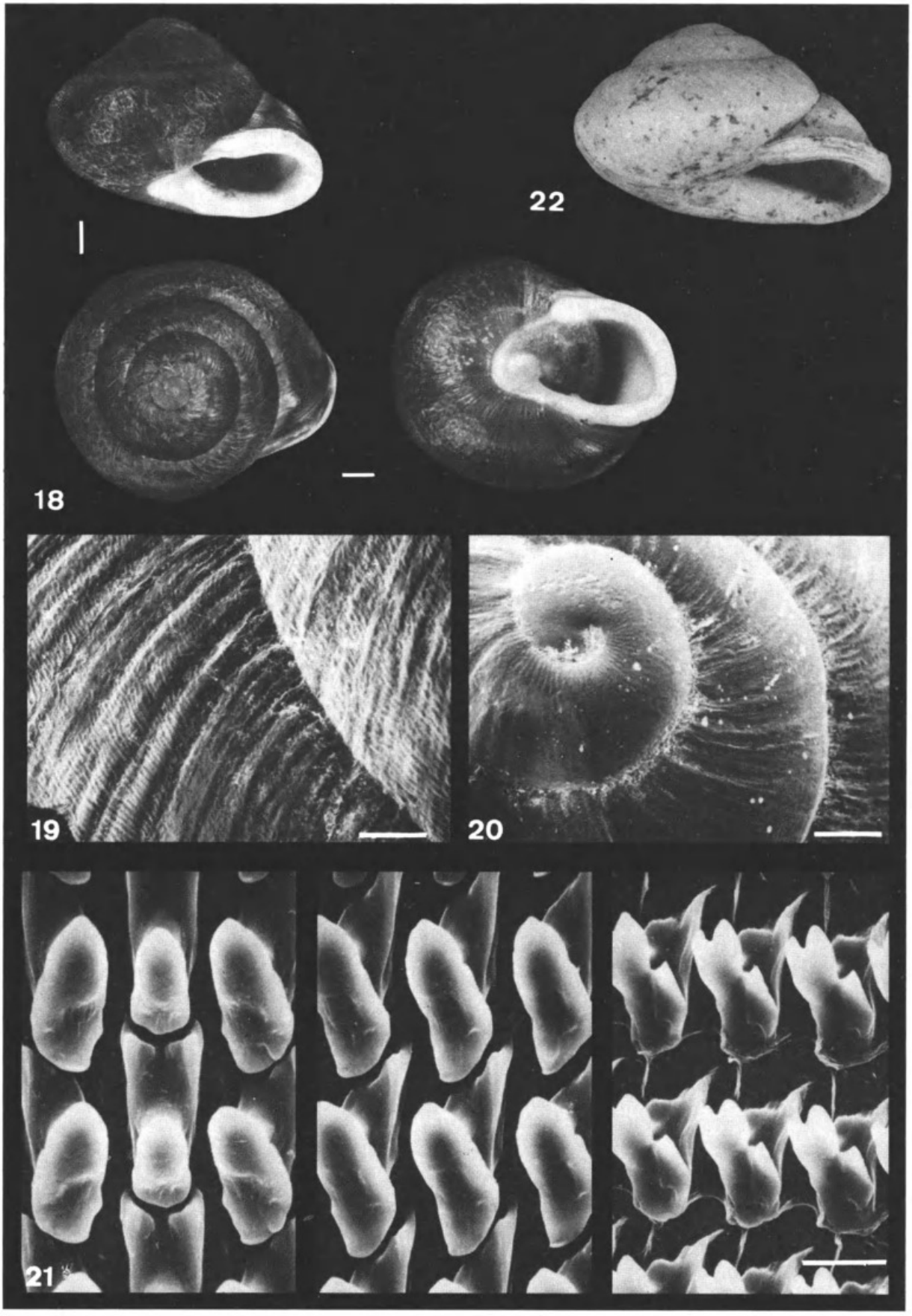

PLATE V. — 18-21, *Hemicycla glyceia silensis* n. ssp. : 18, shell (× 2) of the holotype (El Picón, Monte del Agua, 880 m) ; 19, detail of the body whorl of a paratype (scale : 600 μm) ; 20, protoconch of a paratype (scale 600 μm) ; 21, radula of a paratype (scale : 25 μm).— 22, shell (× 2) of a specimen of *Hemicycla glyceia glyceia* (Mabille, 1882) (quaternary deposits of Punta de Teno, SMF 305833, leg W. TANKE, ex GROH).

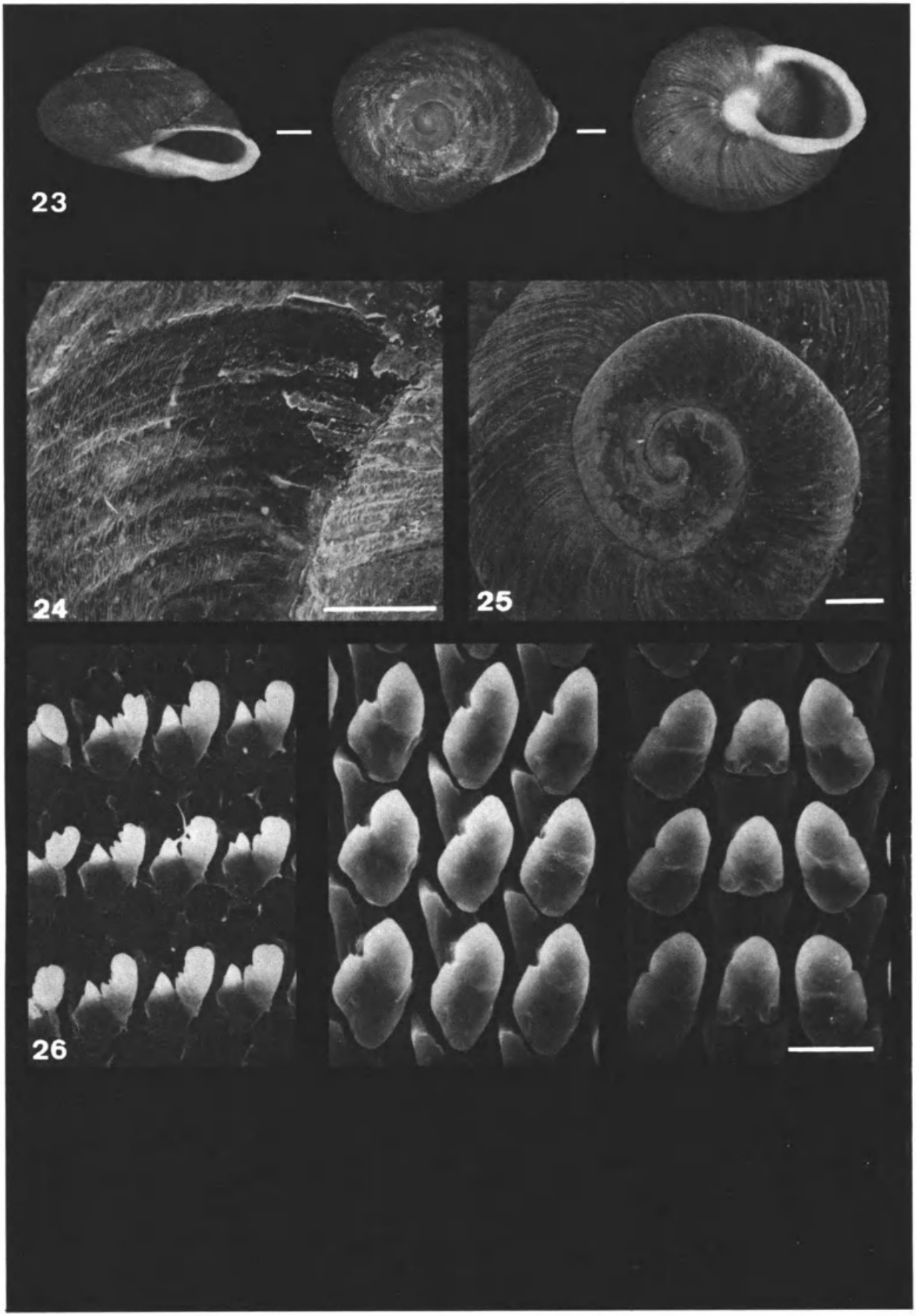

PLATE VI. — *Hemicycla bidentalis inaccessibilis* n. ssp. : 23, shell (× 2) of the holotype (Roque de Fuera de Anaga, 50 m) ; 24, detail of the last two whorls of a paratype (scale : 600 μm) ; 25, protoconch of a paratype (scale : 600 μm) ; 26, radula of the holotype (scale : 25 μm).